

Control and robotics enthusiast, PhD

Overview

Strong background in control and robotics with a proven track record of theory development, design, coding, and field testing of multiple robotic systems (have publications in high-quality journals/confs in control and robotics such as IEEE TCST, RAS, IJRN, IJC, IFAC).

Participated in several industrial and academic research projects in marine and space robotic vehicles funded by the European commission and the European Space Agency (ESA).

Experienced in supervising master students topics on cooperative control of multiple robots, including **aerial drones** and **marine robots**.

Education

July 2021 **PhD in Electrical and Computer Engineering**, *Tecnico Lisboa (IST)*, Portugal.

Advisor: Prof. Antonio M. Pascoal.

April 2015 **M.S. of Research in Electrical Engineering**, *University Technology Petronas (UTP)*, Malaysia.

Advisor: Prof. Idris Ismail.

April 2010 **B.S. in Electrical Engineering**, *Ho Chi Minh City University Technology (HCMUT)*, Viet Nam.

Background

During the PhD program, I had great opportunities to take the following courses to build my background in control, estimation, optimization, and network science:

At IST Lisbon

Nonlinear control	<i>with Antonio Pascoal, at IST Lisbon, 2018</i>
Nonlinear optimization	<i>with Joao Xavier, at IST Lisbon, 2017</i>
Network science: models and distributed algorithms	<i>with Joao Xavier, at IST Lisbon, 2016</i>
Dynamical system and optimization	<i>with Joao Lemos, at IST Lisbon, 2017</i>
Estimation and classification	<i>with Jorge Marques, at IST Lisbon, 2017</i>

At the European Embedded Control Institute (EECI)

Distributed control and computation	<i>with Stephen Morse, at TU Berlin, 2017</i>
Nonlinear system	<i>with Hassan Khalil, at Paris Supélec, 2018</i>
Nonlinear model predictive control	<i>with Frank Allgower, at IIT Madras, 2017</i>

Working experience

2021–Current **Guidance, Navigation, and Control (GNC) Engineer**, *Elecnor-Deimos*, Lisbon.

Design GNC systems for autonomous spacecraft in the context of [ClearSpace](#) project

- Design a 6-DOF H_∞ controller for position and attitude control of a Spacecraft
- Design a GNC system for collision avoidance maneuver of Spacecraft

- 2016–2021 **PhD work**, *ISR/IST, Lisbon, Portugal and (visiting) AMOS center, NTNU, Trondheim, Norway.*
 Contributed to development of algorithms for motion planning, guidance, navigation, and control of multiple robots, in the context of EU funded research projects, namely EUMR, WIMUST, OCEANTECH,
- Develop several cooperative path following algorithms for coordination control of multiple robots.
 - Develop a model predictive control (MPC) framework for simultaneous target localization and tracking using autonomous vehicles.
 - Develop a cooperative distributed estimation (distributed EKF) and control strategy for range-based simultaneous target localization and pursuit using multiple robots.
 - Develop a distributed algorithm for networked multiple robot synchronizations with event-triggered communication mechanisms.
 - Implemented the algorithms developed above and **tested with real networked multiple marine robots** developed by IST Lisbon.
- Software used: Matlab/C++/Python/ROS*
Robot used: [MEDUSA](#) underwater robots, developed by IST Lisbon
- 2012–2015 **Research engineer**, *EE department, UTP.*
 Modelling, system identification, and control of process plants.
- Develop black-box models (ARX, state-space, neuro-fuzzy) for a real lab-scaled gaseous pilot plant.
 - Develop and implement control strategies (PID/MPC) for the real gaseous pilot plant.
- Software used: Matlab/Simulink*
Hardware used: PCI Card interface/ real gaseous pilot plant
- 2010–2012 **Research engineer**, *Schneider Electric automation design center, HCMUT.*
 Study and develop a redundancy solution for a distributed industrial network control system.
- Design and setup a research and training lab in industrial network control system based on the instruments of Schneider Electric.
 - Develop a solution for Programmable Logic Controller (PLC) redundancy based on Unity Pro software and Premium PLC of Schneider Electric
- Software used: SCADA Citect, Several PLC IDEs of Siemens, Schneider Electric*
Hardware used: PLC Schneider, PLC Siemen, Remote I/O, Industrial network (CAN, Modbus)

Teaching and supervision experience

- 2018–2021 **Supervision assistant**, *IST Lisbon.*
 Supervise master's thesis students on several topics in motion planning, guidance, navigation, and control of multiple autonomous vehicles.
- 2018 **Teaching assistant**, *IST Lisbon.*
 Ph.D courses: Nonlinear Optimization with Joao Xavier, Spring semester.
- 2013–2015 **Teaching assistant and lab instructor**, *UTP.*
 Undergraduate courses: Industrial Automation Control System, and Modern Control Engineering.
- 2010–2012 **Lab instructor**, *Automatic control department, HCMUT.*
 Undergraduate courses: Industrial Network, Introduction to Control Engineering.
- 2010–2012 **Trainer**, *Schneider Electric Automation Design Center.*
 Industrial courses for Schneider's customers in Vietnam and Cambodia: PLC Twido, PLC Premium, SCADA Citect, Unity Pro, Industrial Network (Modbus TCP/IP, Modbus RTU, CANopen).

Software experience

MATLAB/Simulink, C++, Python, ROS, Linux, Git, Latex, Casadi, CVX

Hand-on experience

Microcontrollers, Programmable Logic Controller (PLC), Inverter, PCI cards, HMI, industrial network (CAN, Modbus RTU, Modbus TCP/IP)

Awards/Honors

- 2019-2021 Research scholarship, awarded by *IST Lisbon*.
- 2016-2018 Marie-Curie Early Stage Researcher Fellowship, awarded by the *EU commission*.
- 2013-2015 Master scholarship, awarded by *UTP*.
- 2011 First runner up for a "control and automation solution for saving energy in university campus", awarded by *Schneider Electric of South-East Asia*.
- 2011-2012 Exemplary young lecturer, awarded by *HCMUT*.
- 2005 Third place in selection of national gifted student in Physics, awarded by the *Ministry of Education of Viet Nam*.

Languages

Vietnamese	Native
English	Proficient
Portuguese	Basic

Selected Publications

Journals:

- J5. **Nguyen Hung**, Francisco Rego, Joao Quintas, Joao Cruz, Marcelo Jacinto, David Souto, Andre Potes, Luis Sebastiao, Antonio Pascoal "A review of path following control strategies for autonomous robotic vehicles: theory, simulations, and experiments", 2022. [download](#)
- J4. **Nguyen T. Hung**, Francisco Rego, Antonio M. Pascoal, "Cooperative distributed estimation and control of multiple autonomous vehicles for range-based underwater target localization and pursuit", IEEE Transactions on Control Systems and Technology, 2021. [download](#)
- J3. **Nguyen T. Hung**, Antonio M. Pascoal, Tor A. Johansen, "Cooperative path following of constrained autonomous vehicles with model predictive control and event-triggered communications", International Journal of Robust Nonlinear Control, 2020. [download](#)
- J2. **Nguyen T. Hung**, N. Crasta, David Moreno-Salinas, Antonio M. Pascoal, Tor A. Johansen, "Range-based target localization and pursuit with autonomous vehicles: An approach using posterior CRLB and model predictive control", Robotics and Autonomous Systems, 2020. [download](#)
- J1. **Nguyen T. Hung**, Antonio M. Pascoal, "Consensus/synchronization of networked nonlinear multiple agent systems with event-triggered communications", International Journal of Control, 2020. [download](#)

Book chapters:

- B1. Francisco C. Rego, **Nguyen T. Hung**, Colin N. Jones, Antonio M. Pascoal and A. Pedro Aguiar, Chapter 8: "Cooperative Path- Following Control with Logic-Based Communications: Theory and Practice", Navigation and Control of Autonomous Marine Vehicles, IET books, 2019. [download](#)

Conferences:

- C7. Rodrigo Rego, **Nguyen T. Hung**, Antonio Pascoal, "Cooperative Motion Control Using Hybrid Acoustic-Optical Communication Networks", CAMS2021, 2021. [download](#).

- C6. **Nguyen T. Hung**, Antonio M. Pascoal, "range-based navigation and target localization: observability analysis and guidelines for motion planning", IFAC2020, to appear. [download](#)
- C5. J. Quintas, **Nguyen T. Hung**, et al., "AUV path planning, navigation, and control using geophysical data," OCEANS 2019 - Marseille, Marseille, France, 2019. [download](#)
- C4. **Nguyen T. Hung**, F. C. Rego and A. M. Pascoal, "Event-Triggered Communications for the Synchronization of Nonlinear Multi Agent Systems on Weight-Balanced Digraphs," 2019 18th European Control Conference (ECC), Naples, Italy, 2019. [download](#)
- C3. **Nguyen T. Hung**, F. Rego, N. Crasta, Antonio Pascoal, "Input-Constrained Path Following for Autonomous Marine Vehicles with a Global Region of Attraction", The 11th IFAC Conference on Control Applications in Marine Systems, Robotics, and Vehicles-CAMS 2018, Opatija, Croatia. [download](#).
- C2. **Nguyen T. Hung**, Antonio Pascoal, "Cooperative Path Following of Autonomous Vehicles with Model Predictive Control and Event-Triggered Communications", 6th IFAC Conference on Nonlinear Model Predictive Control, Wisconsin, USA, 2018. [download](#)
- C1. Francisco C. Rego, **Nguyen T. Hung**, Antonio Pascoal, "Cooperative Path Following of Autonomous Marine Vehicles: Theory and Experiments", IEEE OES Autonomous Underwater Vehicle, Porto, Portugal, 2018. [download](#)

References' contacts

- 1 **Prof. Antonio Pascoal**, Institute for Systems and Robotics (ISR/IST), Lisbon, Portugal.
Address: IST-Torre Norte Av. Rovisco Pais, 1 1049-001 Lisbon Portugal
Email: antonio@isr.tecnico.ulisboa.pt
Personal page: <https://www.antoniopascoal.com/home-1>
- 2 **Prof. Tor Arne Johansen**, AMOS center, NTNU, Norway.
Address: O.S. Bragstads plass 2D N-7491 Trondheim, Norway
Email: Tor.Arne.Johansen@itk.ntnu.no
Personal page: <https://folk.ntnu.no/torarnj/>
- 3 **Prof. Joao Xavier**, Institute for Systems and Robotics (ISR/IST), Lisbon, Portugal.
Address: IST-Torre Norte Av. Rovisco Pais, 1 1049-001 Lisbon Portugal
Email: jxavier@isr.tecnico.ulisboa.pt
Personal page: <http://users.isr.ist.utl.pt/jxavier/index.html>